



**UNITED STATES PATENT APPLICATION**

**OF**

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**FOR**

**WASHING MACHINE**

[0001] This application claims the benefit of Korean Application(s) No. 10-2002-0075010 filed on November 28, 2002, which is/are hereby incorporated by reference.

## BACKGROUND OF THE INVENTION

### 5 Field of the Invention

[0002] The present invention relates to a washing machine, and more particularly, to a drum installed inside a washing machine.

### Discussion of the Related Art

[0003] Generally, a washing machine includes a drum installed inside. The drum is  
10 rotated to wash a laundry therein. And, the drum is supplied with a prescribed amount of water together with a detergent. The laundry is washed by a chemical reaction between the water and the detergent as well as a mechanical shock by a rotation of the drum. The laundry is rinsed to eliminate the detergent and filth remaining after washing, and is then dewatered finally.

15 [0004] Such a drum of the washing machine includes a base and a sidewall extending an edge of the base. Lifters are installed on an inner circumference of the sidewall as well as a multitude of perforated holes for supplying the water are formed at the drum. The drum is generally prepared by joining both ends of a plate to each other, whereby a joint portion is formed at the drum. Specifically, the joint portion is formed at the sidewall extending in a  
20 length direction.

[0005] However, the joint portion is distinguished from the perforated holes or lifters so as to be easily spotted by a user intending to use the washing machine. Hence, an exterior of the washing machine is degraded as well as the washing machine is depreciated.

## SUMMARY OF THE INVENTION

[0006] Accordingly, the present invention is directed to a washing machine that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

5 [0007] An object of the present invention, which has been devised to solve the foregoing problem, lies in providing a washing machine, by which a joint portion of a drum is indistinguishable.

[0008] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent to those having ordinary skill in the art  
10 upon examination of the following or may be learned from a practice of the invention. The objectives and other advantages of the invention will be realized and attained by the subject matter particularly pointed out in the specification and claims hereof as well as in the appended drawings.

[0009] To achieve these objects and other advantages in accordance with the present  
15 invention, as embodied and broadly described herein, there is provided a washing machine including a housing, a tub in the housing, a drum rotatably installed in the tub to hold a laundry, and a driving means for rotating the drum. And, the drum includes a plurality of lifters on an inner circumference of a sidewall of the drum, a multitude of perforated holes at the sidewall between the lifters, and a joint portion extending on the sidewall in a length  
20 direction to be indistinguishable from the lifters and the perforated holes.

[0010] The joint portion includes a first curled end and a second curled end engaging the first curled end to be joined, and may further include a joint line formed on the sidewall in the length direction. In this case, the joint line comprises a plurality of unit joint lines formed intermittently and the unit joint lines are welding lines or coupling members.

[0011] The joint portion is separated from an adjacent one of the perforated holes in a circumferential direction to leave a same distance between the perforated holes in the circumferential direction. Namely, the joint portion lies parallel with one adjacent column of the adjacent perforated holes to leave a same distance between columns of the perforated holes. Moreover, a distance between the unit joint lines is preferably equal to a distance between the perforated holes belonging to an adjacent perforated holes column.

[0012] The joint portion preferably lies closer to the corresponding lifter than the perforated holes. More preferably, the joint portion lies between the corresponding lifter and a perforated holes column closest to the lifter. Hence, the joint portion lies between the lifters to form a group of columns including perforated holes columns and the joint portion is a first column closest to one of the lifters among the columns.

[0013] Moreover, the joint portion preferably lies symmetrical to a first column of the perforated holes confronting the joint portion centering around the corresponding lifter. More preferably, a distance between the joint portion and the corresponding lifter is equal to a distance between the corresponding lifter and a first column of the perforated holes confronting the joint portion centering around the corresponding lifter. Namely, the corresponding lifter lies on a centerline between the joint portion and a first column of the perforated holes confronting the joint portion centering around the corresponding lifter.

[0014] Therefore, the joint portion is indistinguishable from the neighboring lifters or perforated holes, whereby a quality of the exterior of the drum is substantially enhanced.

[0015] It is to be understood that both the foregoing explanation and the following detailed description of the present invention are exemplary and illustrative and are intended to provide further explanation of the invention as claimed.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[0017] FIG. 1 is a perspective view of a washing machine according to the present invention;

[0018] FIG. 2 is a cross-sectional view of a washing machine according to the present invention;

[0019] FIG. 3 is a layout of a circumference of a drum of a washing machine according to the present invention; and

[0020] FIG. 4 is a perspective view of a joint portion of a drum viewed in a direction of an arrow in FIG. 3.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0021] Reference will now be made in detail to the preferred embodiment(s) of the present invention, examples of which are illustrated in the accompanying drawings. Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

[0022] FIG. 1 is a perspective view of a washing machine according to the present invention and FIG. 2 is a cross-sectional view of a washing machine according to the present invention. The washing machine shown in FIG. 1 and FIG. 2 adopts a front loading type but is as good as a top loading type washing machine except that a tub 20 and a drum 30 are horizontally installed. For convenience of explanation, the present invention is described for

the front loading type washing machine but is applicable to the top loading type washing machine the same manner.

[0023] Referring to FIG. 1 and FIG. 2, a washing machine according to the present invention includes a housing 10, a tub 20 installed in the housing 10, and a drum 30 in the tub  
5 20.

[0024] The housing 10 is designed to hold various parts of the washing machine inside to protect. A door 11 is installed at a front side of the housing 10 to open/close an entrance 10a communicating with the drum 10, and a control panel 12 is installed on the housing 10. A user uses the control panel 12 to direct an operation of the washing machine  
10 and loads a laundry a laundry in/from the drum 30 via the door 11.

[0025] The tub 20 preliminary holds water to supply the water to the drum 30 uniformly. The tub 20 is elastically installed in the housing 10 using dampers 13a and 13b. A penetration hole 20a is formed at a bottom center of the tub 20, and a driving shaft 40b is installed through the penetration hole 20a to be connected to the drum 30. Moreover, a  
15 plurality of ribs 20c are formed on a rear side of the tub 20 to enhance a rigidity of the tub 20.

[0026] The drum 30 holds a laundry 30 and is rotatably installed in the tub 20. And, the drum 30 includes a multitude of perforated holes 30a to make the water flow in from the tub 20. Moreover, a plurality of lifters 30b are attached to an inner circumference of the drum 30 to mix the laundry well.

[0027] A motor 40 is installed at the rear side of the tub 20 to provide a dynamic  
20 force for a rotation of the drum 30. Specifically, the motor 40 includes a stator 41 and a rotor 42 enclosing the stator 41. The stator 42 is installed at the rear side of the tub 20 using a bracket 40a. And, the stator 42 includes a core 41a and a core tooth 41b extending from the core 41a to have a winding coil. The rotor 42 is coupled with the driving shaft 40b, and

includes a frame 42a and a magnet 42b loaded on an inner circumference of the frame 42a. And, the rotor 42 rotates by an electromagnetic force generated between the stator 41 and itself so as to rotate the driving shaft and drum 40b and 30 connected to each other.

[0028] Moreover, in the washing machine, installed are a water supply equipment 50  
5 for supplying the water to the tub 20 and a drain equipment 60 for discharging the used water. The drain equipment 50 includes a water supply pipe 51, a valve 52 provided in the water supply pipe 51, and a detergent box 53. The water supply pipe 51 is connected to the tub 20 and extends through the housing 10 to be connected to an external water supply source. The valve 52 selectively opens or closes the water supply valve 51, and the detergent box 53 holds  
10 a predetermined amount of a detergent therein. Hence, once the valve 52 is turned on, the water follows the water supply pipe 51 from the water supply source to be supplied to the tub 20 together with the detergent via the detergent box 53. Moreover, the drain equipment 60 includes a first drainpipe 61, a pump 62, and a second drainpipe 63. Specifically, the first drainpipe 61 is connected to the tub 20 and the pump 62 and the second drainpipe 63 is  
15 connected to the pump 62 to extend outside the washing machine through the housing 10. Since the pump 62 substantially controls a discharge of the water, the supplied water is always held in the first drainpipe 61 before being discharged. After completion of a washing step, once the pump 62 operates, the used water is discharged outside via the first and second drainpipes 61 and 63. A control equipment 12a is installed inside the control panel 12 and is  
20 electrically connected to various equipments 40, 50, and 60. The control equipment 12a receives a user's direction as an electric signal through the control panel 12 and controls operations of the respective equipments 40, 50, and 60 according to such a direction.

[0029] Meanwhile, warm or hot water is needed according to a kind or state of a laundry. Hence, a heater 70 is included in the washing machine to provide the warm or hot

water by itself. The heater 70, as shown in FIG. 2, is installed at the tub 20 to heat the water held in the tub 20 up to a demanded temperature to supply the heated water to the drum 30. The heater 70 is arranged in a cavity 20b formed in the tub 20, and includes a heating body 71 and a terminal 72. The heating body 71 is substantially disposed in the tub 20, and more precisely, in the cavity 20b to generate heat for heating the water. For this, various heating mechanisms are applicable to the heating body 71. And, the heating body 71 is generally formed of a hot wire. The terminal 72 is electrically connected to a tip of the heating body 71. And, the terminal 72 is disposed outside the tub 20 to be connected to an external power source via a wire to supply electricity to the hating body 71.

[0030] Meanwhile, the drum 30 as shown in FIG. 2, includes a base panel 31 and a sidewall 32 extending from an edge of the base panel 31. The lifters 30b are installed on an inner circumference of the sidewall 32 to leave a predetermined distance from each other. The perforated holes 30a are formed at the sidewalls 32 between the lifters 30b. The sidewall 32 substantially includes a plurality of columns consisting of a multitude of the perforated holes 30a arranged to construct a plurality of columns. In order to form the sidewall 32, one plate is rolled to be cylindrical and both ends of the rolled plate are joined. Hence, a joint portion 33, as shown in FIG. 2 and FIG. 3, extending in a length direction is formed at the drum 30. Both of the ends of the plate, i.e., sidewall 32, can be joined in various ways and is preferably engaged reciprocally. Such a joint portion 33 is explained in detail by referring to FIG. 4.

[0031] FIG. 4 is a perspective view of a joint portion of a drum viewed in a direction of an arrow in FIG. 3.

[0032] Referring to FIG. 4, both of the ends of the sidewall 32 are rolled by curling. One of the curled ends of the sidewall 32 is inserted in the other to be securely engaged. Namely, the joint portion 33 includes a first end 33a that is curled and a second end 33b that is



curled to engage the first end 33a. Hence, the sidewall 32 can be securely formed by the first and second ends 33a and 33b without a separate connecting member. Moreover, the first and second ends 33a and 33b can be partially curled but are preferably curled overall. Hence, the first and second ends 33a and 33b are evenly engaged to each other to reinforce the joint portion 33. Moreover, the joint portion can be additionally welded or coupled by a coupling member to enhance a joint strength thereof. Hence, a joint line 33, i.e., seam, as shown in FIG. 3, is formed along the joint portion 33. The joint line 33c consists of one continuous line or a multitude of unit joint lines formed intermittently. Substantially, each of the unit joint lines can be formed by such a member as a bolt, a rivet, and the like.

10       **[0033]** As mentioned in the foregoing description, such a joint portion 33 has an arrangement different from that of the perforated holes 30a or the lifters 30b so as to be easily distinguished. Hence, in the present invention, the joint portion 33 is formed so as not to be exposed from the lifters 30b and the perforated holes 30a.

15       **[0034]** First of all, the joint portion 33, as shown in FIG. 3, leaves a distance  $d_2$ , which is equal to a circumferential distance  $d_1$  between the perforated holes 30a, from the adjacent perforated holes 30a in a circumferential direction. Namely, the joint portion 33 is arranged parallel with an adjacent perforated hole column, and the distance  $d_2$  between the joint portion 33 and the adjacent perforated holes column is equal to the distance  $d_1$  between the perforated holes columns. Moreover, in case that the joint line 33 is formed, a distance  
20 between the unit joint lines is preferably equal to a distance  $d_3$  between two adjacent perforated holes of the perforated holes column. Furthermore, the unit joint lines are preferably arranged to have the same arrangement pattern of the perforated holes 30a. Namely, if the perforated holes 30a belonging to two adjacent perforated holes columns are staggered, the unit joint lines are staggered to the perforated holes of the perforated holes column

adjacent to the unit joint lines. Hence, the joint portion 33 can be basically arranged together with the perforated holes columns without being exposed.

[0035] Since the perforated holes 30a substantially reduces an effective unit area of the sidewall 32, a rigidity around the perforated holes 30a is smaller than that of other portions. If the joint portion 33 is formed between the perforated holes columns, the joint portion 33 and its surroundings to which a weight is applied are vulnerable to deformation or breakage. Hence, the joint portion 33 is preferably formed in a periphery of the lifter 30b where the perforated holes 33 are formed relatively thin, i.e. in the vicinity of the lifter 30b. As mentioned in the forgoing description, the joint portion 33 is basically arranged adjacent to the perforated holes column to leave the distance  $d_2$ . If the joint portion 33 is formed in the vicinity of the lifter 30b, the joint portion 33 lies between the corresponding lifter 30b and the perforated holes column closest to the corresponding lifter 30b. Namely, the joint portion 33 substantially becomes the column closest to the lifter 30b, i.e., the first column, in the group consisting of the perforated holes columns.

[0036] Moreover, the joint portion 33 is preferably arranged symmetrical to the first perforated holes column in the other group of the perforated holes columns confronting the former centering around the lifter 30b. More preferably, a distance between the joint portion 33 and the lifter 30b is formed equal to a distance  $d_6$  between the lifter 30b and the first perforated holes column symmetrical to the joint portion 33 centering around the lifter 30b. Namely, the lifter 30b is installed on a center line between the joint portion 33 belonging to the former group and the first perforated holes column belonging to the latter group leaving a prescribed distance from the former group. Hence, right and left blanks of the lifter 30 are symmetrical to each other so that the exterior beauty of the drum 30 is more enhanced.

[0037] Accordingly, the washing machine according to the present invention has the

following advantages or effects.

[0038] First of all, in the present invention, the joint portion of the sidewall of the drum lies parallel with one adjacent perforated holes column to leave the same distance between the perforated holes columns from the adjacent perforated holes column. And, the joint portion lies closer to the corresponding lifter than any other perforated holes columns. Hence, the joint portion keeps harmony with the perforated holes and the lifter so as not to be distinguished. Moreover, the joint portion lies symmetrical to the first perforated holes column in the other side of the lifter. Hence, the right and left blanks of the lifter 30 are symmetrical to each other so that the exterior beauty of the drum 30 is more enhanced as well as the joint portion is indistinguishable.

[0039] Therefore, the present invention enhances the quality of the exterior of the washing machine, thereby being remarkably recognizable.

[0040] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover such modifications and variations, provided they come within the scope of the appended claims and their equivalents.